

The indoor occupations that should be provided might include carpentry, wood carving, metal work and cement work and, where facilities are afforded, printing, bookbinding, electric wiring, and cigaret making.

The outdoor occupations should include farming, gardening, care of stock, building operations, wood chopping.

These outdoor occupations become productive occupations if the patient is permitted to utilize the results of his labor by selling his product after purely business arrangements have been made with the hospital for the raw material used, or for rent of land occupied in gardening, farming, or raising stock.

Care must be taken to prevent any given occupation from becoming humdrum. Neither should it ever be below the patient's ability.

The time is past when theater parties, motor rides, and baseball games accomplish anything for our psycho-neurotic cases. These patients should not be allowed to substitute time-passing pleasures for therapeutic occupations. They must be made to feel that they are merely sojourning temporarily in the hospital, that they are simply being overhauled for full duty later.

A REPORT ON THE USE OF CHAULMOOGRA OIL DERIVATIVES IN LEPROSY.

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In this report of the results of the treatment of leprosy in the Virgin Islands with the ethyl ester derivatives of chaulmoogra oil no claim is made for originality. All credit for the results obtained is due to Doctors McDonald and Dean and their coworkers in Hawaii, who first instituted this method of treatment at the Kalihi Hospital in Honolulu, and whose preparation of the oil we used and whose technic we followed. It is our purpose to show the effect of the ethyl esters of chaulmoogra oil upon the various clinical manifestations of the disease as compared with the same clinical symptoms in some patients who did not take the treatment. At our leper colony on the island of St. Croix, Virgin Islands, for the period covered by this report there were 72 patients, 37 of whom requested and received treatment, while 35 refused treatment. Those who refused treatment did so for religious reasons. They belonged to the Christian Mission Church and believed only in divine healing and refused all manner of treatment, except plain water dressings for their ulcers.

Of those that received the treatment there were 27 of the anesthetic type, 2 of the nodular, and 8 of the combined nodular-anesthetic

type. Of those that refused treatment there were 23 of the anesthetic type, none of the nodular, and 12 of the mixed type.

Treatment was started on February 8, 1921, with the ethyl ester derivatives of the fatty acids of chaulmoogra oil received from Hawaii under the arbitrary title of HI. Since our supply of the oil was limited, we administered it only to those requesting it. We gave 1 c. c. the first week intramuscularly into the buttocks; 2 c. c. for the next three weeks; 3 c. c. for the following six weeks, at which time, April 13, 1921, our supply was exhausted and we were forced to discontinue the treatment until September 7, 1921, when, with a new and large supply of the oil on hand, we were able to begin again. Even with the relatively low number of injections and the small dosage given and the long period of five months in which there was no medication, the results obtained are deemed worthy of note. During the period of injections the patients received tonics, the best food obtainable, plenty of exercise, recreation, and rest and small amounts of chaulmoogra oil in capsule by mouth. It was found that the majority of the patients could not take much oil by mouth and it was difficult to continue the oil in greater doses than one-sixth gramme three times a day. In a large number of cases even this small dosage had to be frequently discontinued for variable intervals and in some to be stopped altogether.

In our series the nasal smear was positive for *Bacillus leprae* in 23 of those who received the treatment. Under treatment the nasal smear became negative in every case. Of those who refused treatment there also were positive nasal smears in 23 patients. Of these latter, 15 have become negative without treatment and 8 are still positive.

The effect of the treatment upon the nodules was truly remarkable. There were 10 patients who had nodules in which the disease had existed from 1 to 9 years. The more marked changes were noticed in those patients having leprosy under 6 years' duration. In 2 of the patients the nodules entirely disappeared; in 5 patients most of the nodules were gone, but a few remained which were comparatively tiny; in the remaining 3 patients the nodules were smaller in size and much softer in consistency. In every case there was evidence of marked improvement. Although the nodules were not directly injected, they could be seen getting smaller week by week.

Of the 12 patients that had nodules and refused treatment there was no change for the better in any of them. In eight there was no appreciable change. In four the nodules were more numerous, harder in consistency, and the skin infiltrated to a far greater extent. In one patient the nodules became so large and numerous that they could not be accurately recorded on the outline figure chart.

The effect of the treatment upon the macules was no less striking. Of those patients taking treatment there were macules present on either the face, body, or extremities in 29. Even after the limited treatment given these disappeared entirely in 12 patients. In 8 patients they became smaller, faded, and approached the normal color of the skin. In 5 patients some of the macules had disappeared while the remaining ones were faded. In 4 patients there was no appreciable change. In 1 patient, at the beginning of the treatment, there were 29 areas of disturbed pigmentation; in January, 1922, there were only 4 areas, and these were small and much faded.

In our experience the duration of the disease had no effect upon the disappearance of the macules under treatment. They disappeared in patients who had had leprosy 2, 10, and 12 years, and remained unchanged in patients having had leprosy 2, 3, 6, and 8 years. In one patient the macules, which had begun to fade, became more evident when she became pregnant. In no patient, however, did the blotchy condition of the skin become worse under treatment.

In the patients who refused treatment there were macules present in 25. During the period of this report they disappeared in 2; remained the same in 16; and became more marked and numerous in 7.

Upon the leprosy ulcerations the results were not so striking. This was probably due to the fact that in most of the ulcers there was a secondary invasion by pyogenic organisms upon which the chaulmoogra oil had seemingly no effect. There were ulcers present in eight patients receiving treatment. In four of these the ulcers promptly healed; in one patient the large perforating plantar ulcers became smaller and granulating; while in three patients there was no change.

The duration of the disease did not seem to have any effect upon the healing of the ulcers. Healing seemed to depend rather upon the duration of the ulcer and the extent of the anesthesia. In cases where the ulcers were comparatively recent and the anesthesia slight, there was prompt healing when treatment was instituted. In cases where the ulcers were of long standing and involved bone, and the anesthesia was total, there was no change or, at the most, only slight improvement.

In the patients who refused treatment, ulcers were present in 18. Without treatment 1 healed. 4 remained the same, and the ulcerations in the 13 remaining patients became progressively worse.

The effect of this method of treatment upon disturbed sensation was marked. At the beginning of the treatment there was anesthesia, either slight, marked, or total, in 35 patients. In 6 patients the anesthesia cleared up entirely; in 20 patients there was improvement; while in the remaining 9 there was no change. In those who improved, the areas of total or marked anesthesia became slight, or the

areas of slight anesthesia disappeared. The patients who showed no change or very little improvement were those that had had leprosy for a long period of time, such as for 13, 18, and 25 years.

Most improvement was seen in patients having leprosy less than 5 years, but, improvement was quite marked in those having leprosy less than 10 years. Our records show slight improvement in one patient having had leprosy for 35 years. In no case did the sensory disturbance become worse under treatment.

In the patients that refused treatment anesthesia was present in all 35 cases. Of these, 19 remained the same, while in the remaining 16 the condition became worse either by extension of the areas of anesthesia or by the anesthesia becoming more marked in the areas already present. In no case was there improvement.

Since this treatment was instituted there have been four patients paroled. Two of these patients were entirely free from symptoms, while the other two still had small areas of slight anesthesia. In two of the patients the duration of the leprosy was 3 years, in one 6 years, and in the other 9 years.

None of the patients that have refused treatment have improved so as to be paroled.

The rules that regulate the paroling of the patients provide that they must have at least three successive negative nasal smears and none positive for leper bacilli within the last 6 months; one smear to be taken following a coryza incited by iodides. There must be no open lesions. There must be some improvement in the sensory condition. Nodules must have entirely disappeared. Patients considered ready to be paroled are examined by two physicians who must find them free from any active manifestations of the disease that would constitute a menace to the community should they be released. Under these conditions patients are paroled for two years, during which time they are kept under observation.

There are now seven patients ready to be paroled and one patient who will be ready to be paroled within a few months. Unless there are urgent reasons for paroling patients sooner, it has been considered better to keep them a reasonable length of time so that the maximum improvement might be observed.

Besides the 4 paroled patients and the 8 that can be paroled, improvement was noted in 18 of those receiving treatment. No improvement was found in 7.

On the whole more marked improvement was observed in patients having leprosy less than 5 years, although considerable improvement was found in those of 5-10 years' duration. Those that showed no improvement had had leprosy 6, 8, 13, 18, and 25 years, respectively.

None of the patients refusing treatment improved. Twenty-two remained the same and 13 have become progressively worse.

A few case histories are given to show the effect of the chaulmoogra oil derivatives upon nodules, ulcers, macules, and sensation.

Case 1. H. R.; male; age, 18. Admitted to leper colony March 26, 1915. Three years before admission he noticed nodules on his legs and later on his face and ears, and his hands became swollen. Nasal smears were constantly positive for *B. leprae*. Treatment was started on February 15, 1921. At this time examination showed an advanced condition. His upper eyelids were thickened, his nose enlarged with large nodules on both alae. Part of cartilaginous and bony septum was absorbed. His upper lip was thickened and ulcerated on the inner surface, lower lip was thickened. Tongue was thickened and covered with nodules. Ears were large, thickened, and nodular. Skin over forehead, cheeks, chin, and face generally thickened and gave a leontine appearance. Neck was slightly thickened and covered with nodules. Chest: Upper anterior part thickened and nodular; posteriorly, nodules and blotches present. Abdomen covered with small nodules. Upper extremities: Very nodular throughout, ulcers over both olecranon, all fingers enlarged, ulcer present on dorsum of right hand. Lower extremities: Nodular, skin generally thickened, feet enlarged and show scars of former ulcers.

Sensation: Complete anesthesia of feet and legs as far as knees; slight anesthesia of hands and forearms.

Examination in January, 1922, after treatment, showed the following: Small nodules present on forehead, nose, both ears, lips, and chin; rest of body shows slightly thickened skin where nodules had become absorbed. The leontine expression had gone, ulcers had healed, macules had disappeared, and hands were slightly swollen.

Sensation: Slight anesthesia of face, hands and forearms, feet and legs.

Case 2. J. S.; male; age, 14; admitted to leper colony on October 21, 1919. Nasal smear positive for *B. leprae*. Several months before admission patient noticed macules above right eye. These blotches became larger and patient was sent to this institution. Examination at beginning of treatment on February 15, 1921, showed general discoloration of face with normal skin at irregular intervals. Neck showed 40-50 light patches. Chest, abdomen, and back showed many irregular macules. All extremities showed many macules which were slightly anesthetic. In January, 1922, there were present instead of a couple hundred blotches, only seventeen, and these were so faint that they could be made out with difficulty. His face had entirely cleared up and the nasal smear was negative for *B. leprae*.

Case 3. A. M.; female; age, 40; admitted to the leper colony on October 18, 1918. Treatment was started on February 15, 1921. At this time she had an ulcer on the inner side of her right great toe and a few light-colored areas on the face that merged into one another. Nasal smear was positive for *B. leprae*. Sensation: Slight anesthesia of hands, more on ulnar side and areas on forearms; moderate anesthesia of both feet and of lower half of left leg anteriorly; slight anesthesia of entire right leg and of upper half of left leg anteriorly and entire left leg posteriorly.

In January, 1922, examination showed the following: Nasal smears were negative for *B. leprae*; there were no blotches on face, and the ulcer had healed. Sensation: There was slight anesthesia of both hands, a patch of slight anesthesia on right leg anteriorly, slight anesthesia of both legs posteriorly. On May 6, 1922, there were no ulcers, blotches, or anesthesia and the patient was paroled.

Case 4. W. R.; boy; age, 3½ years; admitted to leper colony on May 24, 1921. A short time before admission there had been noticed light spots on his

face that were slightly anesthetic. Repeated nasal smears were negative. Examination showed well-defined blotches of lighter skin on face and upper and lower extremities. These spots were moderately anesthetic. Sensation: Moderate anesthesia of hands and forearms, slight anesthesia of arms, and slight anesthesia of entire lower extremities. Treatment was started on September 7, 1921, at which time he received one-half c. c. Because of his youth he never has received more than 3 c. c. Up to January, 1922, he had received, besides his initial dose of one 1 c. c., thirteen 2 c. c. doses and two 3 c. c. doses. Examination in January, 1922, showed the spots much smaller and so faint that they could with difficulty be made out. There was no anesthesia.

Case 5. L. C.; female; age, 15; admitted to the leper colony on January 21, 1921. On admission examination showed many irregular macules on face, trunk, and extremities. All of these areas were slightly anesthetic. There was loss of end of right middle finger and flexor contracture of the second, third, and fourth fingers of left hand. Treatment was started on February 15, 1921. Examination in January, 1922, showed that the contractures remain the same, but the macules had quite disappeared. Nasal smears have never been positive.

In order to show the contrast the following case, in which the patient refused all manner of treatment and did not receive the chaulmoogra-oil injections, is outlined. This is an advanced case, but no worse than some of our patients who have received treatment and improved under injections of chaulmoogra-oil derivatives. The progress the disease made in one year without treatment is unusual.

Case 6. L. H.; male; age, 32; admitted to the leper colony March 9, 1910. One year before admission he noticed a light-colored spot on his left cheek. In January, 1921, the nasal smear was positive for *B. leprae*. Examination at that time showed nodules on upper eyelids, nose, ears, lips, cheeks, and neck, chest, extremities, and genitalia. Sensation: Moderate anesthesia of hands and forearms, slight anesthesia of arms and shoulder.

Examination in January, 1922, showed same nodular distribution but nodules were more numerous and larger. Ulcers were present on both feet and left hand. Sensation: That of upper extremity remained the same; slight anesthesia of face and back; total anesthesia of both feet, and anterior surface of both legs; marked anesthesia of right thigh and slight anesthesia of left thigh anteriorly. There was marked anesthesia of both thighs and legs posteriorly.

SUMMARY.

1. Under treatment with chaulmoogra oil derivatives, the nasal smear has become negative for *B. leprae* in every case.

2. In every case presenting nodules there was a marked improvement, and in some cases there was a complete disappearance of the nodules. The less the duration of the leprosy the greater was the effect.

3. In 29 patients with macules there was a complete disappearance of this lesion in 12 and improvement in 13 of the remaining 17. Only 4 did not improve and in these cases the macules became no worse.

4. In 8 patients with ulcers, 4 healed, 1 improved, and 3 remained the same.

5. In 35 patients in whom there was some degree of anesthesia, there was complete disappearance of this manifestation in 6 and in 20 there was improvement. In those who had leprosy of short duration the improvement was more marked.

6. Even with our limited treatment 4 patients have been paroled or 10 per cent of those who received treatment. There are 8 patients to be paroled shortly, making a total of 32 per cent apparently cured.

7. Besides the patients paroled and those to be paroled, improvement was found in 18 others or over 48 per cent, making a total of 80 per cent of the patients under treatment apparently cured or improved.

8. Most marked improvement was noted in patients having leprosy less than 5 years, although improvement was marked in patients having the disease 5 to 10 years.

9. Without treatment, 22 patients remained the same, and 13 became worse. In no case was there any actual improvement.

Our observations have led us to conclude that the ethyl ester derivatives of chaulmoogra oil have a very definite place in the treatment of leprosy. It is believed that they will cure some cases, especially those of relatively short duration, and it is known that they will bring about improvement in a majority of patients to such an extent as to permit their parole. No harmful effects have been observed from its administration.